

NOAA SCIENTIFIC PUBLICATIONS REPORT

NOVEMBER 21, 2016

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[Tropospheric ozone change from 1980 to 2010 dominated by equatorward redistribution of emissions](#)

Nature Geoscience (12.508)

[Risks of ocean acidification on the California Current food web and fisheries: forecasts from an ecosystem model](#)

Global Change Biology (8.444)

CROSS LINE OFFICE ARTICLES

[Genetic assignment to stock of stranded common bottlenose dolphins \(*Tursiops truncatus*\) in southeastern Louisiana after the Deepwater Horizon oil spill](#)

Endangered Species Research (1.325)

[Evidence of cetaceans' exposure to petroleum products following the Deepwater Horizon Oil Spill in the Gulf of Mexico](#)

Endangered Species Research (1.325)

[Assigning stranded bottlenose dolphins to stock using stable isotope ratios following the Deepwater Horizon Oil Spill](#)

Endangered Species Research (1.325)

[The Arctic Marine Pulses Model](#)

Deep Sea Research Part II (2.137)

ADDITIONAL ARTICLES

NOS Publications

[A Bayesian mixture model for missing data in marine mammal growth analysis](#)

Environmental and Ecological Statistics (0.769)

NMFS Publications

[Entanglement is a costly life history stage in large whales](#)

Ecology & Evolution (2.537)



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[An exploratory assessment of thiamine status in western Alaska Chinook Salmon \(*Oncorhynchus tshawytscha*\)](#)

North Pacific Anadromous Fish Commission Bulletin 6 (n/a)

[Persistence of trophic hotspots and relation to human impacts within an upwelling marine ecosystem](#)

Ecological Applications (4.093)

[Using acoustics to prioritize management decisions to protect coastal dolphins: A case study using Hawaiian spinner dolphins](#)

Marine Policy (2.610)

[Cetacean acoustic detections from free-floating vertical hydrophone arrays in the southern California Current](#)

The Journal of the Acoustical Society of America Express Letters (N/A)

[Integrating Commercial Fisheries Registration, Education, and Social Science in the U.S. Virgin Islands](#)

North American Journal of Fisheries Management (1.013)

[Relationships between Chinook Salmon swimming performance and water quality in the San Joaquin River, California](#)

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[Large-scale genotyping-by-sequencing indicates high levels of gene flow in the deep-sea octocoral *Swiftia simplex* \(Nutting 1909\) on the west coast of the United States](#)

PLoS ONE (3.057)

[Juvenile Chinook salmon abundance in the northern Bering Sea: Implications for future returns and fisheries in the Yukon River](#)

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Global Biogeochemical Cycles (4.495)

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[A Shifting Tide: Recommendations for Incorporating Science Communication into Graduate Training](#)

Limnology and Oceanography: Bulletin (n/a)

NESDIS Publications

[Assessing stewardship maturity of the Global Historical Climatology Network-Monthly \(GHCN-M\) dataset: Use case study and lessons learned](#)

D-Lib Magazine (0.68)

[Key ground-based and space-based assets to disentangle magnetic field sources in the Earth's environment](#)

Space Science Reviews (7.242)

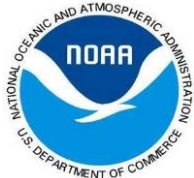
HIGHLIGHTED ARTICLES

Tropospheric ozone change from 1980 to 2010 dominated by equatorward redistribution of emissions

Nature Geoscience (12.508)

Y. Zhang, **O. R. Cooper (OAR/ESRL)**, **A. Gaudel (OAR/ESRL)**, A. M. Thompson, P. Nédélec, S.-Y. Ogino, and J. J. West

- From 1980 to 2010, the location of emissions was the main factor in the increase in the tropospheric ozone burden. Increases in emissions of ozone precursors in the tropics, specifically in Southeast Asia were most important in the global increase.



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- Location of emissions of ozone precursors is as important to the tropospheric ozone burden as the magnitude of emissions is. Emissions in the tropics lead to more efficient ozone production and therefore can have an important effect in global tropospheric ozone.

Ozone is an important air pollutant at the surface, and the third most important anthropogenic greenhouse gas in the troposphere. Since 1980, anthropogenic emissions of ozone precursors—methane, non-methane volatile organic compounds, carbon monoxide and nitrogen oxides (NO_x)—have shifted from developed to developing regions. Emissions have thereby been redistributed equatorwards, where they are expected to have a stronger effect on the tropospheric ozone burden due to greater convection, reaction rates and NO_x sensitivity. Here we use a global chemical transport model to simulate changes in tropospheric ozone concentrations from 1980 to 2010, and to separate the influences of changes in the spatial distribution of global anthropogenic emissions of short-lived pollutants, the magnitude of these emissions, and the global atmospheric methane concentration. We estimate that the increase in ozone burden due to the spatial distribution change slightly exceeds the combined influences of the increased emission magnitude and global methane. Emission increases in Southeast, East and South Asia may be most important for the ozone change, supported by an analysis of statistically significant increases in observed ozone above these regions. The spatial distribution of emissions dominates global tropospheric ozone, suggesting that the future ozone burden will be determined mainly by emissions from low latitudes.

Publication date: November 7, 2016

Available online:

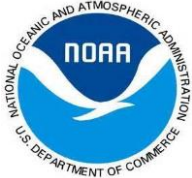
<http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo2827.html>

Risks of ocean acidification on the California Current food web and fisheries: forecasts from an ecosystem model

Global Change Biology (8.444)

K. N. Marshall, **I. C. Kaplan** (NMFS/NWFSC), E. E. Hodgson, A. J. Hermann, **S. S. Busch** (NMFS/NWFSC), **P. McElhany** (NMFS/NWFSC), T. E. Essington, **C. J. Harvey** (NMFS/NWFSC), E. A. Fulton

- The effects of future ocean acidification in the California Current marine ecosystem will be most strongly felt by bottom dwelling (benthic) invertebrates and their predators.



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- Among fisheries, future ocean acidification will have the greatest negative effect on nearshore state-managed fisheries for invertebrates, particularly Dungeness crab.

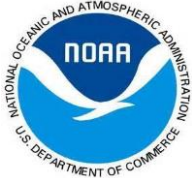
The benefits and ecosystem services that humans derive from the oceans are threatened by numerous global change stressors, one of which is ocean acidification. Here, we describe the effects of ocean acidification on an upwelling system that already experiences inherently low pH conditions, the California Current. We used an end-to-end ecosystem model (Atlantis), forced by downscaled global climate models and informed by a meta-analysis of the pH sensitivities of local taxa, to investigate the direct and indirect effects of future pH on biomass and fisheries revenues. Our model projects a 0.2 unit drop in pH during the summer upwelling season from 2013 to 2063, which results in wide-ranging magnitudes of effects across guilds and functional groups. The most dramatic direct effects of future pH may be expected on epibenthic invertebrates (crabs, shrimps, benthic grazers, benthic detritivores, bivalves), and strong indirect effects expected on some demersal fish, sharks, and epibenthic invertebrates (Dungeness crab) because they consume species known to be sensitive to changing pH. The model's pelagic community, including marine mammals and seabirds, was much less influenced by future pH. Some functional groups were less affected to changing pH in the model than might be expected from experimental studies in the empirical literature due to high population productivity (e.g. copepods, pteropods). Model results suggest strong effects of reduced pH on nearshore state-managed invertebrate fisheries, but modest effects on the groundfish fishery because individual groundfish species exhibited diverse responses to changing pH. Our results provide a set of projections that generally support and build upon previous findings and set the stage for hypotheses to guide future modeling and experimental analysis on the effects of OA on marine ecosystems and fisheries.

Accepted: November 7, 2016

CROSS LINE OFFICE ARTICLES

Genetic assignment to stock of stranded common bottlenose dolphins (Tursiops truncatus) in southeastern Louisiana after the Deepwater Horizon oil spill
Endangered Species Research (1.325)

P. E. Rosel (NMFS/SEFSC), L. A. Wilcox (NMFS/SEFSC), C. Sinclair (NMFS/SEFSC), T. R. Speakman (NOS/NCCOS), M.C. Tumlin, J. A. Litz (NMFS/SEFSC), E. S. Zolman (NOS/NCCOS)



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- Approximately 6–7% of the sampled stranded dolphins from southeastern Louisiana originated from the Western Coastal Stock and the remainder from the smaller, estuarine stock in Barataria Bay, Louisiana.
- The paper presents a new use for assignment tests and a new tool for improving understanding of mortality events on dolphin stocks.

Degradation of marine ecosystems is an increasing problem and extends beyond nearshore coastal waters with significant human development. However, measuring ecosystem damage and decreased ecosystem function can be difficult. Marine mammals have often been recommended as indicators for evaluating ecosystem health. Between March 2010 and July 2014, a significant cetacean unusual mortality event occurred across the northern Gulf of Mexico where multiple demographically independent populations of common bottlenose dolphins occur adjacent to one another. Some populations are fairly small and restricted to small habitat areas, while other populations have higher abundances and cover broader geographic ranges. An integral component to determining the impact of this event on these populations is identifying what percentage of each population the stranded animals comprise. We applied genetic assignment test methods to stranded dolphins from southeastern Louisiana to determine the proportion of dead dolphins that came from the local estuarine population versus the population found in adjacent coastal waters. Forty-one microsatellite loci were genotyped in 156 live dolphins sampled to represent the two potential stocks of origin and in 131 dead stranded dolphins of unknown origin. Both classical assignment tests and genetic stock identification methods indicated that approximately 6–7% of the sampled stranded dolphins originated from the Western Coastal Stock and the remainder from the smaller, estuarine stock in Barataria Bay, Louisiana.

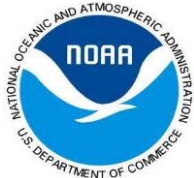
Accepted: October 27, 2016

Evidence of cetaceans' exposure to petroleum products following the Deepwater Horizon Oil Spill in the Gulf of Mexico

Endangered Species Research (1.325)

L. A. Dias (NMFS/SEFSC), J. Litz (NMFS/SEFSC), L. Garrison (NMFS/SEFSC), A. Martinez (NMFS/SEFSC), K. Barry (NMFS/SEFSC), T. Speakman (NOS/NCCOS)

- This publication presents a vital set of data in reporting the exposure of at least 11 cetacean species to oil following the greatest offshore oil spill in US history.



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- The authors provide evidence that cetaceans do not avoid oil as suggested by previously published literature.

The *Deepwater Horizon* (DWH) oil spill was by far the largest offshore oil spill in the history of the United States. For continuous 87 days, the well spilled millions of barrels of oil into the Gulf of Mexico, extensively affecting habitat of numerous species of cetaceans. Previous studies have suggested that cetaceans would be able to detect and avoid oiled waters and, when in contact, oil would not adhere to their slick skin. However, photographic evidence and field observations gathered following the DWH oil spill documented at least 11 cetacean species swimming through oil and sheen and with oil adhered to their skin. This study not only documented direct exposure of cetacean to petroleum products but also the persistence of oil on their skin. In addition, given the extension of the DWH oil spill, the number of affected species and individuals was likely far greater than the documented occurrences captured during this study. Based on this evidence, it is suggested that, during oil spills in cetacean habitat, direct exposure of whales and dolphins to petroleum products will likely occur and should therefore be taken into account during response activities and damage assessments.

Accepted: 13 September 2016

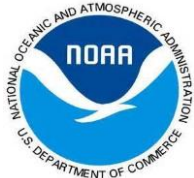
Assigning stranded bottlenose dolphins to stock using stable isotope ratios following the Deepwater Horizon Oil Spill

Endangered Species Research (1.325)

A. A. Hohn (NMFS/SEFSC), L. Thomas, R. H. Carmichael, **J. Litz** (NMFS/SEFSC), C. Clemons-Chevis, S. F. Shippee, **C. Sinclair** (NMFS/SEFSC), S. Smith, **T. R. Speakman** (NOS/NCCOS), M. C. Tumlin, **E. S. Zolman** (NOS/NCCOS)

- This paper used stable isotope ratios to help assign stock to bottlenose dolphins stranded following the DWH oil spill.
- These results were complementary to genetic results in a Rosel et al. (in press) paper for the same issue but genetics information was available for only half the range of concern.
- The two sets of results were combined into a unique analysis by Thomas et al. (includes Rosel and Hohn) that merges very different data sets with very different error structure to find the best possible result for what percentage of the *Tursiops* strandings during DWH came from which stocks.

The potential for stranded dolphins to serve as a tool for monitoring free-ranging populations would be enhanced if stock were known. We used stable isotopes of



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carbon, nitrogen and sulfur from skin to assign stranded bottlenose dolphins (*Tursiops truncatus*) to habitat, as a proxy for stock (demographically independent populations), following the Deepwater Horizon oil spill. Model results from biopsy samples collected from dolphins from known habitats ($n = 205$) resulted in an 80.5% probability of correct assignment. These results were applied to data from stranded dolphins ($n = 217$), resulting in predicted assignment probabilities of 0.473, 0.172, and 0.355 to Estuarine, Barrier Island (BI), and Coastal stocks, respectively. Differences were found west and east of the Mississippi River, with more Coastal dolphins stranding in western Louisiana and more Estuarine dolphins stranding in Mississippi. Two estuarine groups were identified east of the Mississippi River; one associated with estuaries in Mississippi and Alabama and the other associated with estuaries in western Florida. $\delta^{15}\text{N}$ values were higher in stranded samples for both Estuarine and Barrier Island stocks, potentially indicating nutritional stress. High probabilities of correct assignment of the biopsy samples indicates predictable variation in stable isotopes and fidelity to habitat. The power of $\delta^{34}\text{S}$ to discriminate habitats relative to salinity was essential. Stable isotopes may provide guidance regarding where additional testing is warranted to confirm demographic independence and aid in determining the source habitat of stranded dolphins, thus increasing the value of biological data collected from stranded individuals.

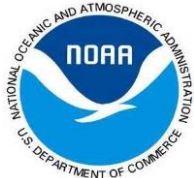
Accepted: October 28, 2016

The Arctic Marine Pulses Model

Deep Sea Research Part II (2.137)

S. E. Moore (NMFS/OST), P. J. Staben (OAR/PMEL), J. M. Grebmeier, and S. R. Okkonen

- The Arctic Marine Pulses (AMP) model was developed that depicts seasonal biophysical ‘pulses’ across a latitudinal gradient by linking processes in four previously-defined contiguous ecological domains, including the: (i) Pacific Arctic domain; (ii) Seasonal Ice Zone domain; (iii) the Marginal domain (i.e., the shelf break and slope); and (iv) Riverine Coastal domain.
- The model aims to encourage integrated research to track seasonal sea-ice and current-flow dynamics, coincident with variability in nutrients, benthic and pelagic production, and upper-trophic species occurrence to provide a foundation for the development of predictive human-inclusive ecosystem models for the Pacific Arctic region.



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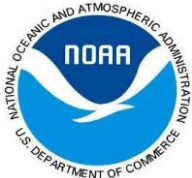
NOVEMBER 21, 2016

The Pacific Arctic marine ecosystem extends from the northern Bering Sea, across the Chukchi and into the East Siberian and Beaufort seas. Food webs in this ecosystem are short, a simplicity that belies the biophysical complexity underlying trophic linkages from primary production to humans. Existing advective and pelagic-benthic coupling models describe processes that connect certain aspects of marine food webs, but do not offer a comprehensive approach to understanding the Pacific Arctic ecosystem. In the course of the Synthesis of Arctic Research (SOAR) project, the Arctic Marine Pulses (AMP) model was developed that depicts seasonal biophysical ‘pulses’ across a latitudinal gradient by linking processes in four previously-defined contiguous ecological domains, including the: (i) Pacific Arctic domain; (ii) Seasonal Ice Zone domain; (iii) the Marginal domain (i.e., the shelf break and slope); and (iv) Riverine Coastal domain. Some of the biophysical processes included in the AMP model, such as pelagic-benthic coupling on the broad shelves of the northern Bering and Chukchi seas and advection and upwelling of zooplankton along the western Beaufort shelf (i.e. the krill trap), have been the focus of long-term studies. Other aspects such as biological processes associated with shifts in seasonal sea-ice phenology and trophic responses to riverine outflow have received less attention. The AMP model provides an annual spatiotemporal framework to guide research on dynamic ecosystem processes during the recent period of rapid biophysical changes in the Pacific Arctic. The model aims to encourage integrated research to track seasonal sea-ice and current-flow dynamics, coincident with variability in nutrients, benthic and pelagic production, and upper-trophic species occurrence to provide a foundation for the development of predictive human-inclusive ecosystem models for the Pacific Arctic region. We suggest that the AMP model, with its focus on phenology, might facilitate communication between conventional science approaches to marine research and seasonal-cycle based indigenous knowledge of marine ecosystems. The goal of improving our understanding of the state and variability of the Pacific Arctic marine ecosystem is a shared one and we conclude with views on how the AMP model can support that goal while contributing to the development of a pan-Arctic ecosystem model.

Available online:

<http://www.sciencedirect.com/science/article/pii/S0967064516301230>

ADDITIONAL ARTICLES



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NOS Publications

A Bayesian mixture model for missing data in marine mammal growth analysis

Environmental and Ecological Statistics (0.769)

M. Shotwell, **W. McFee (NOS/NCCOS)**, E. Slade

- It is important to determine effects of biases on age and growth data of marine mammal populations since the only way to measure this life history demographic is through recovered stranded marine mammals.
- This will be important in analyzing possible cases of stunted growth in dolphins in areas such as the LCP in Georgia and in Barataria Bay, LA.

Much of what is known about bottlenose dolphin (*Tursiops truncatus*) anatomy and physiology is based on necropsies from stranding events. Measurements of total body length, total body mass, and age are used to estimate growth. It is more feasible to retrieve and transport smaller animals for total body mass measurement than larger animals, introducing a systematic bias in sampling. Adverse weather events, volunteer availability, and other unforeseen circumstances also contribute to incomplete measurement. We have developed a Bayesian mixture model to describe growth in detected stranded animals using data from both those that are fully measured and those not fully measured. Our approach uses a shared random effect to link the missingness mechanism (i.e. full/partial measurement) to distinct growth curves in the fully and partially measured populations, thereby enabling drawing of strength for estimation. We use simulation to compare our model to complete case analysis and two common multiple imputation methods according to model mean square error. Results demonstrate that our mixture model is more sensitive to differences in growth curves between the fully and partially measured animals than the competing analyses. The feasibility and utility of our new method is demonstrated by application to South Carolina strandings data.

Accepted: September 22, 2016

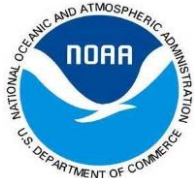
NMFS Publications

Entanglement is a costly life history stage in large whales

Ecology & Evolution (2.537)

J. Van Der Hoop, **P. Corkeron (NMFS/NEFSC)**, M. Moore

- The effects of entanglement of large whales in fishing gear have been considered in terms of their acute impacts (i.e. will the entanglement kill the whale). This paper uses two different bioenergetic approaches to estimate the energy cost of entanglement in North Atlantic right whales. It then



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compares these costs to natural events – e.g. calving and migration - in the life history of these whales.

- This paper demonstrates that entanglement is energetically costly, and may explain some of the variance in calving rates between North Atlantic and southern right whales. It also points out that entanglement is such a common event for individual North Atlantic right whales that it can be viewed as a costly unnatural life history stage, rather than a rare or short-term incident.

Individuals store energy to balance deficits in natural cycles; however, unnatural events can also lead to unbalanced energy budgets. Entanglement in fishing gear is one example of an unnatural but relatively common circumstance that imposes energetic demands of a similar order of magnitude and duration of life history events such as migration and pregnancy in large whales. We present two complementary bioenergetic approaches to estimate the energy associated with entanglement in North Atlantic right whales, and compare these estimates to the natural energetic life history of each individual whale. Differences in measured blubber thicknesses and estimated blubber volumes between normal and entangled, emaciated whales indicate between 7.4×10^{10} J and 1.2×10^{11} J of energy are consumed during the course-to-death of a lethal entanglement. Increased thrust power requirements to overcome drag forces suggest that when entangled, whales require 3.95×10^9 to 4.08×10^{10} J more energy to swim. Individuals who died from their entanglements performed significantly more work (energy expenditure \times time) than those that survived; entanglement duration is therefore critical in determining whales' survival. Significant sublethal energetic impacts also occur, especially in reproductive females. Drag from fishing gear contributes up to 8% of the four-year female reproductive energy budget, delaying time of energetic equilibrium (to restore energy lost by a particular entanglement) for reproduction by months to years. In certain populations, chronic entanglement in fishing gear can be viewed as a costly unnatural life history stage, rather than a rare or short-term incident.

Accepted: October 25, 2016

An exploratory assessment of thiamine status in western Alaska Chinook Salmon (Oncorhynchus tshawytscha)

North Pacific Anadromous Fish Commission Bulletin 6 (n/a)

D. C. Honeyfield, **J. M. Murphy** (NMFS/AKFSC), K. G. Howard, **W. W. Strasburger** (NMFS/AKFSC), A. Matz



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- Significant declines in the productivity of Yukon River Chinook salmon have contributed to closures of commercial, sport, and subsistence harvests in the Yukon River as well as increased pressure to reduce Chinook salmon bycatch in eastern Bering Sea groundfish fisheries. An improved understanding of the underlying production dynamics of Yukon River Chinook Salmon is needed to better address public concern over fishery management decisions.
- This paper identifies the potential for vitamin (thiamine) deficiency in Yukon River Chinook salmon as a plausible mechanism for their reduced productivity.

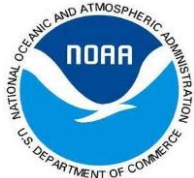
This study was conducted to investigate the thiamine status of Chinook salmon *Oncorhynchus tshawytscha*. Egg thiamine levels in Yukon and Kuskokwim River Chinook were examined in 2001 and 2012. Muscle and liver thiamine in Chinook, coho *O. kisutch*, chum *O. keta*, and pink *O. gorbuscha* salmon were measured in northern Bering Sea juveniles and the percentage of the diet containing thiaminase, an enzyme that destroys thiamine, was calculated. Only 23% of the eggs were thiamine replete ($> 8.0 \text{ nmol} \cdot \text{g}^{-1}$) in 2012. Seventy-four percent of the eggs had thiamine concentrations ($1.5\text{--}8.0 \text{ nmol} \cdot \text{g}^{-1}$) which can lead to mortality from secondary effects of thiamine deficiency. Only 3% of the eggs had $< 1.5 \text{ nmol} \cdot \text{g}^{-1}$ associated with overt fry mortality. In 2001 egg thiamine in upper Yukon Chinook was $11.7 \text{ nmol} \cdot \text{g}^{-1}$ which was higher than that measured in 2012 ($6.2 \text{ nmol} \cdot \text{g}^{-1}$) and paralleled Chinook productivity. Total thiamine ($\text{nmol} \cdot \text{g}^{-1}$) in Bering Sea Chinook muscle (3.8) was similar to coho (4.15), but lower than in chum (8.9) and pink salmon (9.6). Thiaminase-containing prey in Chinook (63%) and coho (36%) stomachs were elevated compared to those of chum (3%) and pink (5%) salmon. These results provide evidence of egg thiamine being less than fully replete. Thiamine deficiency was not observed in juvenile muscle tissue, but differences were present among species reflecting the percentage of diet containing thiaminase. Additional studies are recommended.

Accepted: July 15, 2016

Persistence of trophic hotspots and relation to human impacts within an upwelling marine ecosystem

Ecological Applications (4.093)

J. A. Santora, W. J. Sydeman, I. D. Schroeder, **J. C. Field** (NMFS/SWFSC), R. R. Miller, **B. K. Wells** (NMFS/SWFSC)



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- This study represents a critical step towards resolving pelagic areas of high conservation interest for planktonic ecosystems
- This study may serve as a model for other ocean regions where ecosystem-based management and marine spatial planning of pelagic ecosystems is warranted.

Human impacts (e.g., fishing, pollution and shipping) on pelagic ecosystems are increasing, causing concerns about stresses on marine food webs. Maintaining predator-prey relationships through protection of pelagic hotspots is crucial for conservation and management of living marine resources. Biotic components of pelagic, plankton-based, ecosystems exhibit high variability in abundance in time and space (i.e., extreme patchiness), requiring investigation of persistence of abundance across trophic levels to resolve trophic hotspots. Using a 26-year record of indicators for primary production, secondary (zooplankton and larval fish), and tertiary (seabirds) consumers, we show distributions of trophic hotspots in the southern California Current Ecosystem result from interactions between a strong upwelling center and a productive retention zone with enhanced nutrients which concentrate prey and predators across multiple trophic levels. Trophic hotspots also overlap with human impacts, including fisheries extraction of coastal pelagic and groundfish species, as well as intense commercial shipping traffic. Spatial overlap of trophic hotspots with fisheries and shipping increases vulnerability of the ecosystem to localized depletion of forage fish, ship strikes on marine mammals, and pollution. This study represents a critical step towards resolving pelagic areas of high conservation interest for planktonic ecosystems and may serve as a model for other ocean regions where ecosystem-based management and marine spatial planning of pelagic ecosystems is warranted.

Publication date: November 11, 2016

Available online: <http://onlinelibrary.wiley.com/doi/10.1002/eap.1466/full>

Using acoustics to prioritize management decisions to protect coastal dolphins: A case study using Hawaiian spinner dolphins

Marine Policy (2.610)

H. Heenehan (NMFS/NEFSC), S. M. V. Parijs (NMFS/NEFSC), L. Bejder, J. A. Tyne, D. W. Johnston

- The authors studied interactions between human activities and Hawaiian spinner dolphins.
- Recommendations provided for action to regulate directed dolphin watching.



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For more than a decade, interactions between humans and Hawaiian spinner dolphins in their resting bays have been a concern for members of the general public, managers, scientists, policymakers, and tour operators. Hawaiian spinner dolphins are the target of a large wildlife tourism industry due to their predictable daytime resting behavior and presence in coastal areas. Using results from passive acoustic monitoring between January 2011 and March 2013 on the Kona coast of Hawai'i Island, USA, the relative importance of four known Hawaiian spinner dolphin resting bays, the contribution of anthropogenic noise including vessel noise to the four bay soundscapes, and the dolphins' response to human activities were assessed. Here the findings are summarized and visualized and recommendations are provided for action to regulate directed dolphin watching and ensuing unauthorized takes under the Marine Mammal Protection Act of 1972. These findings and recommendations have implications for the federal government's ongoing efforts to implement rules that protect Hawaiian spinner dolphins in their resting bays.

Accepted: October 11, 2016

Available online: <http://authors.elsevier.com/a/1Tyn5,714MRQIU>

Cetacean acoustic detections from free-floating vertical hydrophone arrays in the southern California Current

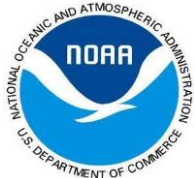
The Journal of the Acoustical Society of America Express Letters (N/A)

E. T. Griffiths and **J. Barlow** (NMFS/SWFSC)

- This paper shows that drifting autonomous recording systems can be used to detect beaked whales and other species.
- This paper lays the foundation for using drifting recording systems to estimate the abundance of cetacean species.

Drifting acoustic recorders were deployed in the southern California Current during Fall, 2014. Two hydrophones configured as a 2-m vertical array at 100 m depth recorded using a 192 kHz sample rate on a 10% duty cycle (2 min/20 min). Beaked whales were detected in 33 of 8,618 two-minute recordings. Sperm whales were detected in 185 recordings, and dolphins in 2,291 recordings. Many beaked whales detected were over an abyssal plain and not associated with slope or seamount features. Results show the feasibility of using free-floating recording systems to detect a variety of cetacean species over periods of several months.

Accepted: October 21, 2016



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Integrating Commercial Fisheries Registration, Education, and Social Science in the U.S. Virgin Islands

North American Journal of Fisheries Management (1.013)

S. Crosson (NMFS/SEFSC) and L. Hibbert (NMFS/SERO)

- This is the first time that economic cost data has been gathered by NOAA economists as part of the fisheries registration process, and demonstrates that accurate economic cost data can be gathered as part of the fisheries registration process.
- This can save considerable time and cost in data collection but only in relatively small scale, regional fisheries.
- The resulting information will be useful for analyzing management measures in the area managed under the Caribbean Fisheries Management Council.

The collection of economic data on commercial fisheries without a formal dealer network often requires time and labor intensive field research. Previous fisheries social and economic research in the Caribbean has embraced stratified or cluster sampling techniques as an efficient alternative to seeking large random samples. We explore an alternative approach wherein fisheries education and research are incorporated into a registration process structured around small group interactions in the U.S. Virgin Islands (USVI). We find that this approach can raise response rates and save considerable effort, but the surveys themselves must be very brief.

Accepted: October 28, 2016

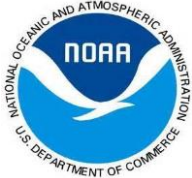
Relationships between Chinook salmon swimming performance and water quality in the San Joaquin River, California

Transactions of the American Fisheries Society (1.73)

B. Lehman, D. D. Huff (NMFS/NWFSC), S. A. Hayes (NMFS/NEFSC), S. T. Lindley (NMFS/SWFSC)

- The results of this research show a negative relationship between the swimming speed of Chinook salmon smolt and the temperature and turbidity of water.
- Swim speed is important for smolts' ability to evade predators during this critical life history stage.
- These results can be used to improve salmon smolt survival by managing water quality (temperature and suspended sediment concentrations) based on optimal conditions for the species.

There is a limited understanding of the potential relationship between environmental conditions and mortality associated with predation. In our study, we



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addressed the hypothesis that poor water quality will decrease a salmon smolt's swimming performance, and therefore presumably its predator evasion capabilities. Predation is a major factor affecting salmon smolt survival throughout the San Joaquin River and Delta in California. Acoustic telemetry, predator stomach content analysis, and baited predation event recorder studies have quantified predation rates, but the effect of water quality on predator evasion capability has not previously been considered. We quantified the swimming performance of juvenile Chinook salmon, *Oncorhynchus tshawytscha*, in relation to water quality parameters. We measured maximum swim speed (U_{\max}) for 45 hatchery-reared Chinook salmon smolts (7.1-9.9 cm FL) in both a controlled and field environment using a mobile swim tunnel respirometer. U_{\max} was measured for fish before and after a two-day exposure within the lower San Joaquin River (California, USA) while being held in flow-through cages. In order to sample across a diversity of environmental conditions, we conducted trials during a six-week period that coincided with the peak smolt out-migration. We constructed regression models to evaluate the relationship between swimming performance and temperature, turbidity, pH, O_2 , conductivity and chlorophyll. We found a negative relationship between maximum swim speed and temperature and turbidity and described these relationships graphically. Our findings suggest that opportunities for water quality management that may improve salmon smolt survival include managing temperatures and suspended sediment concentrations to optimize the swimming capacity of migrating smolts. These management actions may also improve a migrating smolt's ability to evade predators.

Accepted: November 6, 2016

*Large-scale genotyping-by-sequencing indicates high levels of gene flow in the deep-sea octocoral *Swiftia simplex* (Nutting 1909) on the west coast of the United States*

PLoS ONE (3.057)

M. V. Everett (NMFS/NWFSC), L. K. Park (NMFS/NWFSC), E. A. Berntson (NMFS/NWFSC), A. E. Elz (NMFS/NWFSC), C. E. Whitmire (NMFS/NWFSC), A. A. Keller (NMFS/NWFSC), M. E. Clarke (NMFS/NWFSC)

- First study on genetic connectivity of deep sea corals on the coast of WA/OR/CA.
- No significant genetic structure among this species on the West coast.



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Deep-sea corals are a critical component of habitat in the deep-sea, existing as regional hotspots for biodiversity, and are associated with increased assemblages of fish, including commercially important species. Because sampling these species is so difficult, little is known about the connectivity and life history of deep-sea octocoral populations. This study evaluates the genetic connectivity among 23 individuals of the deep-sea octocoral *Swiftia simplex* collected from Eastern Pacific waters along the west coast of the United States. We utilized high-throughput restriction-site associated DNA (RAD)-tag sequencing to develop the first molecular genetic resource for the deep-sea octocoral, *Swiftia simplex*. Using this technique we discovered thousands of putative genome-wide SNPs in this species, and after quality control, successfully genotyped 1,145 SNPs across individuals sampled from California to Washington. These SNPs were used to assess putative population structure across the region. A STRUCTURE analysis as well as a principal coordinates analysis both failed to detect any population differentiation across all geographic areas in these collections. Additionally, after assigning individuals to putative population groups geographically, no significant F_{ST} values could be detected (F_{ST} for the full data set 0.0056), and no significant isolation by distance could be detected ($p=0.999$). Taken together, these results indicate a high degree of connectivity and potential panmixia in *S. simplex* along this portion of the continental shelf.

Available Online:

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0165279>

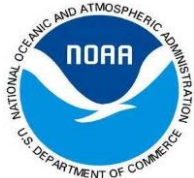
Juvenile Chinook salmon abundance in the northern Bering Sea: Implications for future returns and fisheries in the Yukon River

Deep Sea Research II (2.137)

J. M. Murphy (NMFS/AKFSC), **K. G. Howard**, **J. C. Gann** (NMFS/AKFSC), **K. C. Cieciel** (NMFS/AKFSC), **W. D. Templin**, **C. M. Guthrie III** (NMFS/AKFSC)

- Juvenile abundance predicts returns of Yukon River Chinook salmon, indicating that interannual variation in production of Yukon River Chinook salmon is primarily established during their early life-history stage.
- Juvenile Chinook salmon abundance in the northern Bering Sea shelf has increased since 2013 which indicates a recovery of the Yukon River Chinook salmon stock.

Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) abundance in the northern Bering Sea is used to provide insight into future returns and fisheries in the Yukon



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River. The status of Yukon River Chinook Salmon is of concern due to recent production declines and subsequent closures of commercial, sport, and personal use fisheries, and severe restrictions on subsistence fisheries in the Yukon River. Surface trawl catch data, mixed layer depth adjustments, and genetic stock mixtures are used to estimate juvenile abundance for the Canadian-origin stock group from the Yukon River. Abundance ranged from a low of 0.62 million in 2012 to a high of 2.58 million in 2013 with an overall average of 1.5 million from 2003 to 2015. Although abundance estimates indicate that average survival is relatively low (average of 5.2%), juvenile abundance was significantly correlated ($r = 0.87$, $p = 0.005$) with adult returns, indicating that much of the variability in survival occurs during early life-history stages (freshwater and initial marine). Juvenile abundance in the northern Bering Sea has increased since 2013 due to an increase in early life-history survival (average juveniles-per-spawner increased from 29 to 59). The increase in juvenile abundance is projected to produce larger runs and increased subsistence fishing opportunities for Chinook Salmon in the Yukon River as early as 2016.

Accepted: June 22, 2016

Available online: <http://dx.doi.org/10.1016/j.dsr2.2016.06.002>

OAR Publications

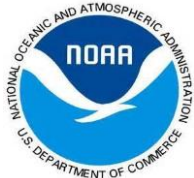
Equatorial Pacific thermostad response to El Niño

Journal of Geophysical Research—Oceans (3.44)

G. C. Johnson (OAR/PMEL), A. N. Birnbaum

- This paper examines the response of the Equatorial Pacific Thermostad to El Niño.

El Niños are characterized by a shift of warm surface water from the western to eastern equatorial Pacific due to weakening of easterly trade winds. This shift is associated with the pycnocline (or thermocline), the large vertical density gradient beneath the surface mixed layer, shoaling in the west and deepening in the east, inducing a redistribution of ocean heat with global impacts. Here the response of the Equatorial Pacific Thermostad, a layer of low vertical stratification below the pycnocline, to El Niño is investigated using a monthly Argo float climatology and Argo float deep velocity data. A mean, seasonal cycle, trend, and time-lagged linear response to the Niño3.4 index are fit by least squares to temperature and salinity at each gridpoint as well as to deep float velocities (omitting the trend). The results of these fits are used to characterize the response of physical properties in the Thermostad, including layer thickness and velocity, to El Niño by comparing



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the mean properties following neutral conditions ($Ni\tilde{no}3.4 = 0^{\circ}C$) versus those following a moderate El Niño ($Ni\tilde{no}3.4 = 1^{\circ}C$). Following an El Niño, a strengthening of the westward-flowing Equatorial Intermediate Current of about $2.7 \times 10^6 \text{ m}^3 \text{ s}^{-1}$ shifts about $97 \times 10^{12} \text{ m}^3$ of thermostad water from the east to the west, allowing conservation of volume within the Thermostad as the pycnocline above deepens in the east and shoals in the west. This transport and volume change imply a 14-month time scale, consistent with El Niño.

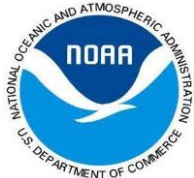
Accepted: November 7, 2016

Simulating ENSO SSTA from TAO/Triton winds: The impacts of 20 years of buoy observations in the waveguide and comparison with reanalysis products
Journal of Climate (4.31)

A. M. Chiodi (OAR/PMEL), D. E. Harrison (OAR/PMEL)

- This study compares equatorial Pacific zonal wind data from numerical weather prediction model reanalyses with estimates from TAO (Tropical Atmosphere Ocean)/Triton moored buoy observations over 20 years.

The fundamental importance of near-equatorial zonal wind stress in the evolution of the tropical Pacific Ocean's seasonal cycle and El Niño-Southern Oscillation (ENSO) events is well known. It has been two decades since the TAO/Triton buoy array was deployed, in part to provide accurate surface wind observations across the Pacific waveguide. It is timely to revisit the impact of TAO/Triton winds on our ability to simulate and thereby understand the evolution of sea surface temperature (SST) in this region. This work shows that forced ocean model simulations of SST anomalies (SSTAs) during the periods with a reasonably high buoy data return rate can reproduce the major elements of SSTA variability during ENSO events using a wind stress field computed from TAO/Triton observations only. This demonstrates that the buoy array usefully fulfills its waveguide-wind-measurement purpose. Comparison of several reanalysis wind fields commonly used in recent ENSO studies with the TAO/Triton observations reveals substantial biases in the reanalyses that cause substantial errors in the variability and trends of the reanalysis-forced SST simulations. In particular, the negative trend in the ERA-Interim reanalysis is much larger than, and the NCEP/NCEP2 reanalysis variability much less than seen in the TAO/Triton wind observations. There are also mean biases. Thus, even with the TAO/Triton observations available for assimilation into these wind products, there remain oceanically important differences. The reanalyses would be much more useful for ENSO and tropical Pacific climate



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change study if they would more effectively assimilate the TAO/Triton observations.

Publication Date: November 2, 2016

Available online: <http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-15-0865.1>

Phytoplankton size impact on export flux in the global ocean

Global Biogeochemical Cycles (4.495)

C. B. Mouw, A. Barnett, G. A. McKinley, L. Gloege, and **D. Pilcher**
(OAR/PMEL)

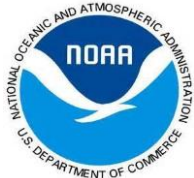
- Small phytoplankton cells had greater export flux efficiency but lower transfer efficiency.
- Large phytoplankton cells were more refractory and sank faster with greater transfer efficiency.

Efficiency of the biological pump of carbon to the deep ocean depends largely on biologically mediated export of carbon from the surface ocean and its remineralization with depth. Global satellite studies have primarily focused on chlorophyll concentration and net primary production (NPP) to understand the role of phytoplankton in these processes. Recent satellite retrievals of phytoplankton composition now allow for the size of phytoplankton cells to be considered. Here we improve understanding of phytoplankton size structure impacts on particle export, remineralization, and transfer. A global compilation of particulate organic carbon (POC) flux estimated from sediment traps and ^{234}Th are utilized. Annual climatologies of NPP, percent microplankton, and POC flux at four time series locations and within biogeochemical provinces are constructed. Parameters that characterize POC flux versus depth (export flux ratio, labile fraction, and remineralization length scale) are fit for time series locations, biogeochemical provinces, and times of the year dominated by small and large phytoplankton cells where phytoplankton cell size show enough dynamic range over the annual cycle. Considering all data together, our findings support the idea of high export flux but low transfer efficiency in productive regions and vice versa for oligotrophic regions. However, when parsing by dominant size class, we find periods dominated by small cells to have both greater export flux efficiency and lower transfer efficiency than periods when large cells comprise a greater proportion of the phytoplankton community.

Publication Date: October 29, 2016

Available Online:

<http://onlinelibrary.wiley.com/doi/10.1002/2015GB005355/abstract>



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Dry deposition of particles to canopies – A look back and the road forward

Journal of Geophysical Research-Atmospheres (3.318)

B. Hicks, R. Saylor, **B. Baker (OAR/ARL)**

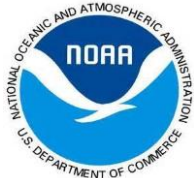
- Dry deposition is an important removal process for atmospheric aerosol particles.
- The algorithms that describe this process in air quality models (both forecast and regulatory models), atmospheric chemistry and climate models, and future weather forecast models do not adequately depict the actual removal process as it occurs in the real atmosphere, thereby affecting these models' ability to simulate atmospheric aerosol distributions accurately.

The so-called accumulation size range of airborne particles is the center of a continuing disagreement about the formulation of dry deposition. Some contemporary meteorological and air quality models use theoretical developments based on early wind tunnel and other controlled experiments, while other models consider the bulk properties of the underlying surface and the ability of atmospheric turbulence to deliver particles to it. This dichotomy arose when the first micrometeorological measurements of particle deposition velocities became available, yielding numbers exceeding the highest expectations of the then-current models based on assumptions about inertial impaction and interception. The model predictions had previously been shown to be in accord with theoretical treatments of filtration. A common reaction was to distrust the field experimental results, but the experimental findings were supported by subsequent studies. The difference between model predictions and field measurements appears greatest for densely vegetated canopies. Ongoing research is investigating factors that could give rise to the discrepancy, e.g. turbulence intermittency, leaf orientation, leaf morphology, leaf flutter, electrical charges, and a number of phoretic effects. In the meantime, many investigators are faced with a decision as to whether to make use of parameterized field results or theoretical descriptions of behaviors that are not yet well examined. Here, the history of the ongoing disagreement is reviewed and some possible resolutions are presented.

Publication Date: December 2016

Available Online:

<http://onlinelibrary.wiley.com/doi/10.1002/2015JD024742/abstract>



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A Shifting Tide: Recommendations for Incorporating Science Communication into Graduate Training

Limnology and Oceanography: Bulletin (n/a)

E. J. Hundey, J. H. Olker, C. Carreira, R. M. Daigle, **A. K. Elgin (OAR/GLERL)**, M. Finiguerra, N. J. Gownaris, N. Hayes, L. Heffner, N. R. Razavi, P. D. Shirey, B. B. Tolar, E. M. Wood-Charlson

- The goals of this publication are to: (1) capture the experiences of early career scientists, (2) investigate training gaps, and (3) recommend approaches to improve science communication.
- Science communication is an important part of conducting research. The recommendations put forth in this manuscript are designed to improve the training that graduate students receive in this important skill.

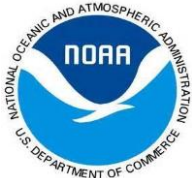
Scientists who are skilled in communication reap professional and personal rewards. Unfortunately, gaps exist in fostering curricular and extracurricular training in science communication. We focus our article on opportunities for university- and department-level leadership to train new scientists to communicate effectively. Our motivation is threefold: (1) communication training is key to being competitive in the increasingly diverse job market, (2) training early career scientists in communication “jump-starts” personal and societal benefits, and (3) the authors represent a group of early career aquatic scientists with unique insights on the state of and need for training. We surveyed early career aquatic scientists about their science communication training experiences. In summary, survey respondents indicated that (1) science communication training is important; (2) graduate students are interested in training that is not currently available to them; (3) departments and advisors are moderately supportive of students participating in science communication, but less enthusiastic about providing training support; and (4) graduate students lack opportunities to put science communication training into practice. We recommend departments and institutions recognize the benefits of science communication training, develop a strategy to support such training, and facilitate individualized approaches to science communication.

Publication Date: October 26, 2016

NESDIS Publications

Assessing stewardship maturity of the Global Historical Climatology Network-Monthly (GHCN-M) dataset: Use case study and lessons learned

D-Lib Magazine (0.68)



NOAA SCIENTIFIC PUBLICATIONS REPORT

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G. Peng (NESDIS/NCEI), J. Lawrimore (NESDIS/NCEI), V. Toner (NESDIS/NCEI), C. Lief (NESDIS/NCEI), R. Baldwin (NESDIS/NCEI), N. Ritchey (NESDIS/NCEI), D. Brinegar (NESDIS/NCEI), S. A. Del Greco (NESDIS/NCEI)

- An application of data stewardship maturity matrix is useful to people who produce or care for digital environmental datasets. Assessments can identify the strengths and weaknesses of an individual dataset or organization's preservation and stewardship practices, including how information about the dataset is integrated into different systems.
- Consistent metadata and documentation are not only beneficial for system integration but also good resources for the Integrated Product Team members.

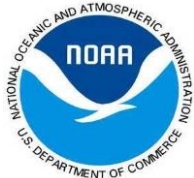
Assessing stewardship maturity — the current state of how datasets are documented, preserved, stewarded, and made accessible publicly — is a critical step towards meeting U.S. federal regulations, organizational requirements, and user needs. The scientific data stewardship maturity matrix (DSMM), developed in partnership with NOAA's National Centers of Environmental Information (NCEI) and the Cooperative Institute for Climate and Satellites–North Carolina (CICS-NC), provides a consistent framework for assessing stewardship maturity of individual Earth Science datasets and capturing justifications for transparency. The consolidated stewardship maturity information will allow users and decision-makers to make informed use decisions based on their unique data needs. This DSMM was applied to a widely utilized monthly-land-surface-temperature dataset derived from the Global Historical Climatology Network (GHCN-M). This paper describes the stewardship maturity ratings of GHCN-M version 3 and provides actionable recommendations for improving the maturity of the dataset. The results from the use case study show that an application of DSMM like this one is useful to people who produce or care for digital environmental datasets. Assessments can identify the strengths and weaknesses of an individual dataset or organization's preservation and stewardship practices, including how information about the dataset is integrated into different systems.

Publication Date: November, 2016

Available Online: <http://www.dlib.org/dlib/november16/peng/11peng.html>

Key ground-based and space-based assets to disentangle magnetic field sources in the Earth's environment

Space Science Reviews (7.242)



NOAA SCIENTIFIC PUBLICATIONS REPORT

NOVEMBER 21, 2016

A. Chulliat (NESDIS/NCEI), J. Matzka, A. Masson, S. E. Milan

- This paper provides a review of the observational infrastructure available to the geomagnetism community.
- A majority of recent advances in the field of observational geomagnetism were obtained from low Earth orbit satellite data and by combining those with ground-based data and data from other satellites.
- Recommendations for making future progress in the field are included.

The magnetic field measured on the ground or in space is the addition of several sources: from flows within the Earth's core to electric currents in distant regions of the magnetosphere. Properly separating and characterizing these sources requires appropriate observations, both ground-based and space-based. In the present paper, we review the existing observational infrastructure, from magnetic observatories and magnetometer arrays on the ground to satellites in low-Earth (Swarm) and highly elliptical (Cluster) orbits. We also review the capability of SuperDARN to provide polar ionospheric convection patterns supporting magnetic observations. The past two decades have been marked by exciting new developments in all observation types. We review these developments, focusing on how they complement each other and how they have led or could lead in the near future to improved separation and modeling of the geomagnetic sources.

Publication Date: October 18, 2016

Available Online: <http://dx.doi.org/10.1007/s11214-016-0291-y>